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Nota di contenuto	Introduction -- Incompressible Navier-Stokes Equations -- Mathematical Basis of Turbulence Modeling -- The k – Model -- Laws of the Turbulence by Similarity Principles -- Steady Navier-Stokes Equations with Wall Laws and Fixed Eddy Viscosities -- Analysis of the Continuous Steady NS-TKE Model -- Evolutionary NS-TKE Model -- Finite Element Approximation of Steady Smagorinsky Model -- Finite Element Approximation of Evolution Smagorinsky Model -- A Projection-based Variational Multi-Scale Model -- Numerical Approximation of NS-TKE Model -- Numerical Experiments -- Appendix A: Tool Box.

Sommario/riassunto

With applications to climate, technology, and industry, the modeling and numerical simulation of turbulent flows are rich with history and modern relevance. The complexity of the problems that arise in the study of turbulence requires tools from various scientific disciplines, including mathematics, physics, engineering, and computer science. Authored by two experts in the area with a long history of collaboration, this monograph provides a current, detailed look at several turbulence models from both the theoretical and numerical perspectives. The k-epsilon, large-eddy simulation, and other models are rigorously derived and their performance is analyzed using benchmark simulations for real-world turbulent flows. Mathematical and Numerical Foundations of Turbulence Models and Applications is an ideal reference for students in applied mathematics and engineering, as well as researchers in mathematical and numerical fluid dynamics. It is also a valuable resource for advanced graduate students in fluid dynamics, engineers, physical oceanographers, meteorologists, and climatologists.